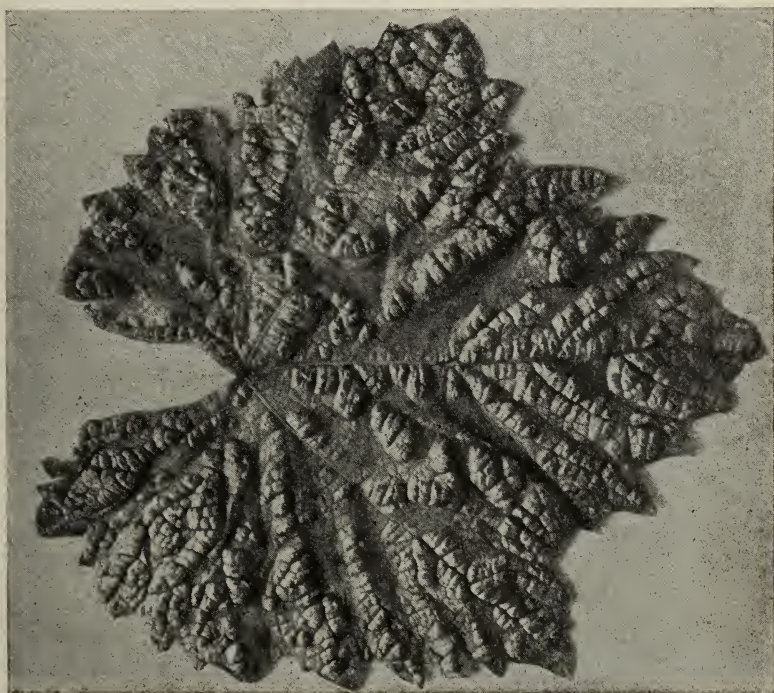


UNIVERSITY OF CALIFORNIA—COLLEGE OF AGRICULTURE.
AGRICULTURAL EXPERIMENT STATION.

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ERINOSE OF THE VINE.

By FREDERIC T. BIOLETTI AND E. H. TWIGHT.




VINE LEAF AFFECTED WITH ERINOSE—UPPER SURFACE.

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ERINOSE OF THE VINE.

BY FREDERIC T. BIOLETTI AND E. H. TWIGHT.

For the last five years specimens of vine leaves affected with Erinose have been received at the Agricultural Experiment Station in increasing numbers. The disease is evidently spreading rapidly throughout the vineyards of California, and the number of inquiries received concerning it makes it desirable that an account of it, available for general distribution, should be published.

Erinose is a disease of the vine characterized by swellings on the upper surface of the leaves, and corresponding depressions on the lower surface. These swellings, when numerous, cause considerable deformation of the leaves, but not the change of color to yellow or brown which is characteristic of most fungous diseases. Even very badly-affected leaves retain almost their normal green color until late in the season. The depressions on the under side are coated with a thick felt-like covering, which, at first pure white, gradually turns rusty and finally becomes dark brown. Generally, the swellings and corresponding depressions are isolated and few in number on the affected leaves, but in severe cases they are numerous enough to become confluent, and the whole lower surface is then completely hidden by the felt-like covering. Occasionally, indeed, the felt-like material extends to the upper surface in narrow strips bordering the veins, and may even be found on the petioles and flower clusters.

Most of the specimens received at the laboratory were sent under the impression that they were attacked by a fungus, and, in fact, the coating has a strong superficial resemblance to some fungous growths. A microscopic examination shows, however, that it consists of a mass of hypertrophied hairs or abnormal outgrowths of the epidermal cells of the leaf. They are larger, more abundant, and more persistent than the normal leaf-hairs of the leaf, and differ also in being often branched and usually unicellular. This abnormal growth, in common with similar growths found on other plants, is called an *erineum*, from a Greek word meaning woolly. This is the derivation of the word Erinose, which means woolly disease, a very appropriate name. The erineae of leaves were formerly supposed to be of fungous origin, but are now known to be due to the attacks of minute mites. The stings or punctures of these mites exert a stimulating effect upon the epidermal



FIG. 1.

White patches of erineum on the lower surface of a leaf as they appear in the earlier part of the season.

Upper surface of a badly affected leaf, showing how the erineum extends to the upper surface in severe cases.



FIG. 2. Lower surface of the leaf shown in the frontispiece, showing the brown patches of erineum as they appear in autumn.

cells of the leaf, which causes them to grow out into the abnormal hair-like processes already described. The mite causing Erinose of the vine is known as *Phytoptus vitis*, and is related to the mites causing a similar disease of the walnut and the leaf-blister of the pear, both of which are very common in California.

The *Phytoptus vitis* is not a true insect, but a mite or acarid belonging to the class of Arachnida to which belong also spiders, scorpions, ticks, and our common clover-mite or red spider so destructive to fruit trees. These mites are extremely minute, and only a practiced eye can perceive them, among the tangled mass of erineum on the leaf, by the aid of an ordinary hand magnifier, and then only with great difficulty. To see them easily they must be separated and examined with a microscope magnifying at least fifty diameters. To isolate them the method recommended by Valery Mayet is probably the best. With a sharp knife scrape off a quantity of the erineum into a watch-glass. As soon as the hairs begin to dry-up, the mites abandon them and may be found congregated in numbers around the edge of the watch-glass. The form which we usually find upon the vine leaves is an elongated, flexible, almost cylindrical, worm-like larva about $\frac{1}{250}$ of an inch in length and $\frac{1}{800}$ of an inch in diameter. The mite is furnished at one end with four legs, and is armed with two piercing organs, with which it attacks the leaves. Notwithstanding its small size and apparently awkward shape it is very lively in its movements and shows remarkable vitality. It has been known to survive an immersion of forty-eight hours in water, and has been seen to lay eggs after remaining in glycerine for twenty-four hours. Like other members of the group, the *Phytoptus vitis* passes through several forms, and, besides the common larva already described, has at different stages of its metamorphosis six and eight legs, the latter being the perfect form. The four-legged larvæ pass the winter under the rough bark of the vine or among the scales of the buds, many of them without change of form, while others surround themselves with a kind of transparent cyst.

Amount of Injury.—Erinose was formerly considered to be a very serious disease of the vine, owing to the fact that its effects were confused with those of the powdery mildew. It is only in very exceptional cases that it is, alone, capable of doing serious injury to the vine or its crop. When accompanying oidium or drought it may, however, perceptibly increase the damage due to these causes. When very abundant, it may seriously interfere with the growth of young vines, but, according to Mayet, never damages old vines, except by interfering slightly with the ripening of the canes or at most causing an almost imperceptible diminution of crop. All varieties of vines are not equally attacked. According to Ravaz, certain American species such as Berlandieri,

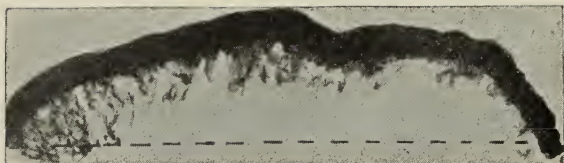


FIG. 3. Photomicrograph of a cross-section through an affected area of a vine leaf, showing the erineum in the depression on the lower surface. The broken line shows the position that this portion of the leaf would have occupied had it not been attacked by the mites.



FIG. 4. Vine affected with Erinose.

Mustang, Cinerea, Cordifolia, and Scuppernong are immune. All varieties of vinifera are susceptible, but not equally. Of varieties cultivated in California, Sauvignon, Sirah, Marsanne, and Gamay Teinturier are said by Ravaz to be little subject to attack, while Aramon, Cinsaut, and Frontignan (Small Muscatel) are very susceptible. The worst cases so far observed in California have been on Flame Tokay and Mission, but it has been found also on other varieties, among them Zinfandel and Muscat.

Methods of Treatment.—Since sulfuring the vines for the treatment of oidium has become general in France there has been little trouble with Erinose. The phytoptus seems as sensitive to the fumes of sulfur as the red spider, and several sulfurings during the late spring and early summer are recommended for the control of the mite. The only vineyards which have been found badly affected in California are those in which little or no sulfuring has been done, or those where the growth of foliage has been so luxuriant as to prevent the evaporation of the sulfur by the sun. In the latter cases the vines are so strong that they practically receive no harm from the disease. In severe cases a winter treatment of the vine stumps is practiced in France. This treatment consists in pouring about one quart of boiling water over the stump. For very large stumps a somewhat greater amount of water is used, and for smaller vines a proportionate amount. This method is said to be very efficacious, and with the portable boilers constructed for the purpose two men can treat from 1500 to 2000 vines per day. Cuttings taken from affected vines for the purpose of rooting or grafting may be thoroughly disinfected by placing them in hot water (122° F.) for ten minutes. If this is done carefully all the mites and their eggs will be destroyed without injury to the cuttings.

Distribution in California.—The first specimens of Erinose received by the Experiment Station were sent from Windsor, Sonoma County, in 1896. The next year, affected leaves were received from Healdsburg and Dry Creek, in the same county. All these cases were upon Mission vines. Since then, specimens of the disease have been received as follows: 1898, from Kenwood, Sonoma County, on Zinfandel; 1899, from Lytton and Sebastopol, Sonoma County; 1901, from Martinez, Contra Costa County, Roseville, Placer County, Florin and Folsom, Sacramento County, Cloverdale, Sonoma County, and from Dinuba, Tulare County.

A short account of this disease was given in the fifth biennial report of the California State Board of Horticulture, on page 50, where its occurrence is noted at Florin, Sacramento County.

